

NEWS LETTER

Vol.05 JUL 2011

Benefits of an Artificial Dermis, PELNAC™, for Fingertip Injuries and Amputated Fingers



Masato Kurokawa M.D.,

Director, Department of Plastic Surgery,
Japanese Red Cross Kumamoto Hospital Former of Director,
Department of Plastic Surgery, Takarazuka City Hospital

Introduction

PELNAC is a bilayer artificial dermis consisting of an atelocollagen sponge layer and a silicone film membrane. It is used to treat full-thickness skin defects. The author has reported the benefits of using PELNAC for extremity injuries, giant nevi and skin defects after malignant skin tumor surgery.¹⁾⁻²⁾ In this News Letter, the author explains how excellent outcomes were achieved using PELNAC to treat finger traumas, including fingertip injuries and amputated fingers.

Application of PELNAC for reattachment of amputated hands and fingers

Method

When amputated hands or fingers are replanted, the amputated hand or finger may be incised to locate blood vessels having anastomotic potential. After distal and proximal blood vessels are anastomosed at this site, the incised skin is generally sutured. However, due to swelling that occurs during surgery, suturing may compress the blood vessels and obstruct the blood flow. In such cases, PELNAC is temporarily applied and fixed to the surrounding skin with sutures, rather than immediately suturing the incised site. Subsequently, the site is dressed lightly, without applying pressure. The silicone film of PELNAC is removed after 2 to 3 weeks, and epithelization from the surrounding area is promoted by treatment with an ointment and/or a bFGF preparation. If epithelization is judged to be slow, thin split-thickness skin grafting is performed.

Case 1 A male patient, aged 47 years, with amputation of the left thumb.

The patient's left thumb was completely amputated at the proximal phalanx by an electric saw (Fig. 1a). He was immediately brought to our emergency department and underwent replantation surgery. After bone fixation and tendon repair, 2 arteries (radial digital artery and ulnar digital artery of the thumb) were anastomosed, and two veins were anastomosed on the dorsal side of the thumb (Fig. 1b). After blood vessel anastomosis and nerve repair, the skin was sutured. For the ulnar side of the thumb, we judged that the anastomosed blood vessels were likely to be compressed if the incised site was immediately sutured, so PELNAC was applied to the skin defect and sutured to the surrounding skin (Fig. 1c). The thumb survived, and when the silicone film of PELNAC was removed 3 weeks after surgery, the blood vessels had been covered with a favorable granulation tissue (Fig. 1d). A bFGF preparation was subsequently sprayed on and a wet dressing applied, and the skin defect site had become completely epithelized 6 weeks after the surgery (Fig. 1e). The scar later contracted with no problems in blood flow, the thumb completely survived, and no pain or postoperative functional disturbance was reported.



Fig. 1a



Fig. 1b



Fig. 1c



Fig. 1d



Fig. 1e

Key points in the use of PELNAC

1. PELNAC is usually immersed in physiological saline before use. However, this is not particularly necessary if there is abundant exudate at the intended site of application.
2. PELNAC should be fixed with mild compression; excessive compression should be avoided. Tie-over fixation is unnecessary.
3. For extensive defects, the fenestrated type should be used, or PELNAC should be slit for drainage.

Case 2 A male patient, aged 38 years, with amputation of the left hand.

The patient's left hand was amputated at the left wrist by a cutting machine during work (Fig. 2a). He was immediately brought to an emergency department and underwent replantation surgery. The bones were fused together, and the tendons and median nerve were sutured. The radial and ulnar arteries as well as the cephalic, basilic and median antebrachial veins were then sutured, and the ulnar nerve and superficial branch of the radial nerve were also sutured (Fig. 2b). On this occasion, the dorsal side of the hand was incised to search for the cephalic and basilic veins and the superficial branch of the radial nerve. Since swelling at the amputation site was observed when the skin was about to be sutured, PELNAC was applied and fixed with sutures instead of suturing the skin incision site (Fig. 2c). Three weeks after surgery, the silicone film of PELNAC was removed, and skin was harvested from the lateral side of the patient's left upper arm for thin split-thickness skin grafting. The amputated hand survived and, after additional surgery including opponensplasty, it recovered to a state in which the patient could grasp objects loosely (Figs. 2d ~ 2h).



Fig. 2a



Fig. 2b



Fig. 2c



Fig. 2d



Fig. 2e



Fig. 2f



Fig. 2g



Fig. 2h

Application of PELNAC and bFGF preparation for fingertip injuries

Method

PELNAC is often used for fingertip injuries, especially when the distal phalanx is exposed. First, the wound is irrigated thoroughly, and bFGF preparation is sprayed on the wound surface. PELNAC is then cut to match the size of the skin defect wound and fixed to the surrounding skin with sutures. Then 0.1 to 0.3 mL of bFGF preparation is injected into the collagen sponge of PELNAC, and it is also injected into the collagen sponge at the time of each dressing change, once every 2 or 3 days. Two to Three weeks after surgery, the silicone film of PELNAC is removed, but spraying of the bFGF preparation on the wound surface is continued until epithelization is complete.

Case 3 A female patient, aged 40 years, with fingertip amputation of the left ring finger.

The patient's finger was guillotine-amputated at the one-third proximal position on the nail plate of her left ring finger when it became caught in a machine during work. She was immediately brought to an emergency department, but since the fingertip was missing, PELNAC was sutured onto the skin defect site, and bFGF preparation was applied. Subsequently, the bFGF preparation was injected into the collagen sponge of PELNAC at the patient's twice-weekly hospital visits. When the silicone film of PELNAC was removed 2 weeks after the surgery, favorable granulation tissue had formed. After the removal of the silicone film, bFGF preparation was sprayed twice a week with ointment treatment, and epithelization was complete 5 weeks after the surgery. The notable points about this case are that the fingertip had a good shape and actually grew in length. This latter effect was possibly due to good formation of granulation tissue, induced by the bFGF preparation in combination with the use of PELNAC collagen layer as a scaffold, resulting in regeneration of soft tissue.



References

- 1) M. Kurokawa, M. Satoh, Y. Yasugi: Surgical Treatment of Skin Cancer with an artificial dermis. *Skin Cancer* 24 (3):392-6, 2009.
- 2) M. Kurokawa, M. Satoh, M. Nakayama, Y. Yasugi: Treatment of Severe Wounds on the Extremities Using an Artificial Dermis before Free Flap Transfer. *Japan Society for Surgical Wound Care* 1 (2):81-7, 2010.

GUNZE

**GUNZE LIMITED
Medical Division**

<http://www.gunze.co.jp/e/medical/>

● Japan

TOKYO OFFICE

Nihonbashi2-10-4, Chuo-ku, TOKYO 103-0027 Japan
Tel: +81-3-3276-8718 Fax: +81-3-3276-8696

● Europe

GUNZE INTERNATIONAL EUROPE GmbH

Oststraße 80, 40210 Düsseldorf, Germany
Tel. +49 211 36 13 971 Fax. +49 211 36 13 164

● Asia Pacific

GUNZE MEDICAL DEVICES (SHENZHEN) LIMITED

Room 802, Kerry Center, 2008 Renminnan Rd., SHENZHEN 518001 P.R. China
Tel. +86-755-8230-0553 Fax. +86-755-8230-0469

● U.S.A.

GUNZE INTERNATIONAL USA, INCORPORATED

5 West 37th Street, Suite 800 New York, NY, 10018, U.S.A
Tel. +1-212-354-9060 Fax. +1-212-354-6171